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THESIS

RETENTION AND PROMOTION RATES OF NAVAL FEMALE OFFICERS

by

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ABSTRACT

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iii

TABLE OF CONTENTS

I. INTRODUCTION

The military today is confronted with many of the same issues that the civilian community encounters, including among others excessive turnover and the promotion of quality individuals. An understanding of the causal factors of turnover and promotion is fundamental in formulating improved personnel and manpower policies. This information can be very useful to large companies and organizations that rely on the feedback they receive from employees to help improve their personnel policies. The United States Navy is like these companies with respect to retention in that it relies on information from its members from various surveys and questionnaires in order to understand the factors that contribute to individuals remaining in or leaving the service. Some of the reasons they cite are, actual work environment, family influence, civilian opportunities, job satisfaction, pay and promotion opportunities.

Researchers from all fields of study have investigated employee turnover behavior. Each researcher has attempted to find some explanatory relationship between turnover and selected variables. They hope to aid employers in detecting sources of dissatisfaction and to devise ways to deal with the problem.

1

In this age of force reductions and drawdowns, the challenge of maintaining and promoting a high caliber officer force is one of the major topics of interest among manpower planners. After investing thousands of dollars training individuals, it is cost-effective to retain a quality individual for long periods. When an officer leaves the Navy, whether it is voluntarily or involuntarily, not only are the costs of countless hours of specialized training wasted, the costs of recruiting and training a replacement must also be considered. Training cannot take the place of experience, which is why retaining and promoting qualified individuals is so important. Loss of skilled junior officers can cause several problems, such as lack of experience in critical areas, less promotion selectability, and inefficient use of scarce training dollars. That is why it is so important that the right people be promoted, and that they be promoted on time. Qualifed individuals that are doing what they are supposed to do, "hitting the wickets", aggressive, and hard-charging should be rewarded. The Navy should not have to lose them to the civilian sector.

Retaining and promoting the most qualified individual increases the level of expertise available in an organization. What goes into an individual's decision to remain in the Navy and what are some of the factors that make an individual promotable? This thesis will address some of the precommissioning factors involved in the decision of female

2

Naval officers across communities to remain in or leave the Navy. Since the author is approaching her LCDR promotion board, she was interested to see if there were any differences in the retention and promotion rates of females across communities. Some of the factors included in the study are accession source, undergraduate GPA and major, selectivity of college, marital status, and race. The major hypothesis of this thesis is: (a) these factors do impact retention and promotion and, (b) an individual's community does not affect retention or promotion.

A. LITERATURE REVIEW

A study by Lockman and Cymrot states that the chances of promotion to Lieutenant Commander are 26 percentage points higher for graduate-educated officers than for those lacking a Master's degree [Ref. 1]. One of the advantages of obtaining a degree is that the officer escapes the Defense Officer Personnel Act (DOPMA), which establishes the laws governing military promotion and retirement practices [Ref. 2]. If an officer fails to screen for promotion to the next higher rank for two consecutive years, he is subject to an involuntary release from the military. This might suggest that officers with graduate degrees remain in the Navy longer and are promoted faster. In the empirical analysis below, the impact of graduate education on retention will be examined.

A 1977 study also reveals that Naval Academy graduates have higher survivor rates, continuation rates, and larger in-zone promotion rates than officers from any other source [Ref. 3]. This indicates that commissioning source may be a significant factor in explaining retention and promotion rates. This thesis also examines the impact of commissioning source on retention and promotion.

There have been economic and non-economic studies done on the subject of retention. One of the models used to emphasize some of the economic factors on retention is the ACOL model. ACOL stands for the Annualized Cost of Leaving model (ACOL). In this model individuals are assumed to evaluate the present value of the financial cost of leaving over each possible future time horizon of military service and to compare this with the present value of their yearly table for service factors. Over each possible horizon, the financial cost of leaving is the present value of the active duty military pay plus the increment in the present value of retirement pay minus the present value of the civilian earnings foregone. [Ref. 4]

Warner and Goldberg state that the condition for remaining in the military may be expressed as: An=Cn/[dj > (Yc-Ym)=Y where An is the "annualized cost of leaving" or ACOL,; Cn is the cost of leaving or difference between the present values of the two pay streams, Ym and Yc are the factors to leave, dj is the present value at the time of the reenlistment decision of

4

a dollar received j years in the future, and Y is the net taste for civilian life over military life. [Ref. 5]

An individual will prefer to remain in the military for n more years (rather than leaving immediately) only if the annualized cost of leaving exceeds the net taste for civilian life. The individual will leave only if the strategy of leaving immediately is preferred to any strategy that involves staying or An < y for n=1.....s. This is equivalent to the condition (max An) > y. Hence the relevant ACOL value for the retention decision is the maximum over the set (A,..An) and the relevant time horizon for the retention decision is the one over which the ACOL value is maximized. The max value of An is denoted A* [Ref. 5].

Numerous prior studies have analyzed the factors affecting an individual's decision to remain with or leave an organization. Military studies often focus on the attrition and retention behavior of enlisted personnel, but few analyses thoroughly examine the retention of officers. The studies that are available provide a baseline with which to analyze behavior based on human capital investment decisions. Human capital is an asset with expected future benefits. Several reenlistment analyses reveal general insights as to retention decisions of enlisted personnel, which may apply to officers as well.

Various studies have been conducted on the relationship between the intentions of individuals to leave a job and their

5

actual behavior. A person's intentions based on the perceptions of her job is difficult to analyze. According to a study completed by Mobley, Horner, and Hollingsworth, job satisfaction affects intentions to quit and intentions to search for a new job---both of these intentions then affect the individuals actual behavior [Ref. 6]. A study by Arnold and Feldman approaches the question of intention and actual behavior by analyzing the factors that cause employees to remain with a company [Ref. 7]. Perceived job security, intentions to look for other work, perceived existence of other work, and intentions to change job positions were found to influence turnover behavior. As stated before, someone with a Master's degree demonstrates more maturity and stability, and this also may be reflected in longer retention [Ref. 8].

An individual weighs many factors, some of which include economic and personal aspirations, before entering into any long-term committment. Many of these factors will be surveyed during the study. However, they will not be included in the study, but need to be kept in mind when modeling.

Family structure is one of the many external factors which influence an individual's decision to choose a military career and remain with it. Szoc and Seboda looked at retention as a function of several aspects of the family lifestyle. They found a definite negative relationship between spouse employment and officer retention. Specifically, if the spouse held a professional position, the officer was less likely to

stay in the military. Szoc and Seboda also found the greater number of dependents the more likely they were to remain in the service. Spouses' opinions were also found to have an effect on the decision. As the number of years in the service increased, the spouse's attitude became more positive toward the Navy [Ref. 9].

In 1979, Derr and Associates conducted a qualitative survey of Navy officers and their wives. They found that 19 percent of the surveyed sample of officers claimed their wives were either looking for work or already had a job [Ref. 10]. The percentages were somewhat different than those presented by Kringer who found that 71 percent of the responding spouses in a 1986 Air Force Survey were either employed in some capacity or looking for work [Ref. 11]. These contrasting figures may be due to variances between the services, or they may be more indicative of the increase in dual-income households. Both wage earners' employment potentials play a critical role in the decision to stay or leave the military.

Each year there are selection boards for promoting officers. These promotion boards recommend officers for promotion based on guidance from the Secretary of the Navy and Navy instructions. The information of interest that is provided to the promotion board is the maximum number of officers to be promoted within each promotion category. Although many officers are qualified, not all are promoted.

7

What are some of the characteristics that influence the promotion of a female Naval officer? Are there any differences in the promotion rates across communities? The analysis presented in this thesis will attempt to answer these questions.

There is small, but growing literature on the performance and promotion of officers. Mike Foster in his NPS Master's thesis examined differences in performance by commissioning source through the use of a performance index. Foster states there are three indicators that can be used to compare officer performance [Ref. 12]. They are first, performance indices which are derived from specific aspects of officer fitness reports. Second, the officer characteristics associated with above average promotion rates can be used. Third, review the performance of the officers retained beyond their initial obligation period.

Foster in his research found that commissioning source was not significant in all of his models. The differences between the sources were small, but it could be seen that Naval Academy graduates outperformed NROTC and OCS graduates. He also found that the type of undergraduate education an officer has received appeared to have little relevance to the productivity of that officer [Ref. 12].

William Bowman and Idell Neumann both used performance indices to monitor officer performance. Bowman's research focuses on the Surface and Submarine Warfare communities. One

8

of Bowman's more important findings to the author is that racial minorities are less likely to be superior performers, but blacks are more likely to remain in the service beyond their initial obligation. [Ref. 12]

Neumann's objective in her research is to expand the Naval Academy selection system to include predictors of later officer performance while in the fleet. Neumann's study takes into account data from high school. She finds that recommendations from high school officials and extracurricular high school activities were found to have potential for predicting officer performance. [Ref. 12]

Congressional Budget Office (CBO) paper dated June 1990, [Ref. 13] states that some factors to be considered when looking at promotion are undergraduate school and commissioning source. CBO found that graduates of the service academies remained in the military longer. They also found, although the average months to promotion from paygrade 02 to 03 differed across services, there was not much difference among the different commissioning sources within each service for speed of promotion to paygrade 04. Another of their findings showed rates of involuntary separation to be low across the board, but somewhat lower for ROTC graduates than for Academy or OCS graduates.

Bowman in his research dealing with the actual promotion of surface warfare officers and pilots, found that the most important undergraduate factor relating to the retention of

naval officers is the cumulative grade point average [Ref. 14]. He states that grade point average increases the likelihood of voluntary separation for the surface officer. Also, those with higher grades are more likely to be selected early and in-zone and less likely to be passed over the first look. Bowman also found that females are less likely to leave voluntarily and more likely to be promoted than males in the surface warfare community.

David Wise in his research found that the rate of promotions in civilian organizations has been found to increase with college selectivity, college GPA, and rank in graduate school [Ref. 15]. He states that promotion is positively related to leadership ability and negatively related to an individual's desire for job security.

The literature cited here provides a framework and basis for examining the relationship between retention and promotion of females across communities. The next chapter of this thesis gives a brief description of the different communities available to females. Chapter III presents the method of analysis and a description of the data. Construction of the data set is discussed along with the model design. Chapter IV consists of the results of the model and a discussion of the analysis. Chapter V deals with the conclusions of the analysis and makes recommendations for follow-on work.

II. COMMUNITY DESCRIPTION

This chapter provides a description of each of the Navy's major officer communities. The information comes from the Unrestricted Line Officer Career Planning Guidebook [Ref.16].

A. SURFACE WARFARE

The Surface Warfare community is composed of officers who are qualified in the surface warfare specialty. They control the surface ships of the Navy and their goal is to command those ships. The Surface Warfare Officer (SWO) must develop experience and in-depth knowledge of the fundamentals in a specific line discipline, such as operations, combat systems, or engineering. A Surface Warfare officer must also be knowledgeable in the operations of the various ship types within the surface force. There must also be an appreciation of air and submarine warfare, as well as operations in a multi-threat environment. Because of the restriction on women in combat the number of ships that women are allowed to serve on are significantly smaller than the number for men. With new legislation in Congress, this may soon change. The data set used in this study indicates only 3.7 percent of female LTs and 2.5 percent of female LCDRs are in the Surface Warfare community. (see table 1)

TABLE 1. COMMUNITY PERCENTAGES OF LT AND LCDR FEMALES

COMMUNITY	% LT	% LCDR
General Unrestricted Line	54.5	40.2
Medical Services	25.3	40.4
Surface/Aviation Warfare	7.1	5.1
Restricted Line	6.4	7.8
Staff	4.1	3.7
Miscellaneous	2.3	2.8

B. AVIATION WARFARE

The Aviation community is made up of Pilots and Naval Flight Officers. Both are involved in some facet of naval aviation as a primary career pursuit. These officers make up over one-half of the unrestricted line officers of the Navy, but only 3.4 percent of the female LTs and 2.5 percent of the female LCDRs were in this community. General aircraft assignment for pilots and NFO's is highly competitive. All performance from the initial day of training is critical.

Again the combat law restricts females as to the type of aircraft they can fly.

C. GENERAL UNRESTRICTED LINE OFFICERS

The General Unrestricted Line community is predominately composed of women. They are assigned to a variety of shore billets, most of which are administrative in nature. Their mission is to provide the Navy with a community of officers of proven leadership, shore management expertise, and subspecialty expertise, who can manage the increasingly complex fleet support establishment. General URL officers are first and foremost "officers of the line" and therefore leadership development is a key to career progression. Leadership development requires supervision of personnel (officers, enlisted, and civilians) coupled with management of resources (finances, equipment, property) at various levels of responsibility. Over one-half of female LTs (54.5 percent) are in this community while 40.2 percent of female LCDRs are General Unrestricted Line officers.

D. RESTRICTED LINE

Competition for the Restricted Line is extremely competitive. Many of the communities rely heavily on lateral accessions from the Unrestricted Line. The performance record as an Unrestricted Line officer is as much a factor in the selection process for the Restricted Line or Staff Corps as it

13

is for any URL promotion or screening board. Female LTs account for 6.4 percent of the Restricted Line while female LCDRs account for 7.8 percent of the Restricted Line. Following are the six Restricted Line communities women can enter into.

1. **Engineering Duty (14xx)**

A career as an Engineering Duty officer (EDO) provides an officer with a variety of career paths. When EDOs are assigned, their unique role as a technical specialist for the acquisition, construction, maintenance, and modernization of ship combat/weapon systems, ordnance systems and electronic systems is considered. Additionally, the EDO has a role in the research and development efforts of ship acquisition.

2. **Aviation Maintenance Duty (152x)**

The Aviation Maintenance Duty officer (AMDO) provides full time professional maintenance managers for Naval aviation. The AMDO is a fleet experienced, technically qualified and well educated Naval officer. A professional maintenance manager, the heart of the AMDO lies in operational billets managing the maintenance efforts at both the organizational (squadrons) and intermediate (Aviation Intermediate Maintenance Depots) levels of maintenance.[1]

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[1]Females can also enter the Aeronautical Engineering Duty community but they only comprise .1% of the LCDRs and none of the LTs so they were not described here.

3. **Cryptology (161x)**

The Cryptologic community conducts Electronic Warfare Support Measure (ESM) in support of fleet operations and manages national signals intelligence collection efforts. The cryptologic officer serves in the areas of collection, analysis/reporting, high frequency direction finding, signals security, administration communications, or electronic maintenance. The cryptologic community is extremely competitive. They obtain most of their accessions as transfers from the URL. Performance, educational background, and relevant experience is extremely important for selection.

4. **Intelligence (163x)**

Intelligence specialist officers receive the training and experience required to provide full appreciation of the various facets of intelligence and familiarity with fleet operations and requirements. Most jobs will be in Fleet Intelligence Centers, Joint and Navy Staffs, D.C headquarters activities, and Fleet Replacement Squadrons.

5. **Public Affairs (165x)**

The Navy's success in obtaining the people and hardware necessary for a high state of readiness depends upon the full understanding and support of the American public. External and internal public understanding and support are the principal objectives of the Navy's public affairs program. The program includes public information, internal information

and community relations. This community generally with fewer than 70 officers in any one grade level does not have much assignment flexibility.

6. Oceanography (180x)

The Oceanography community is composed of officers qualified by education and experience to meet Navy requirements for expertise in the environmental sciences, primarily physical oceanography, meterology and mapping, charting and geodesign. The technical competence demanded of the Oceanography community translates to heavy emphasis on scientific education.

E. STAFF

1. Supply Corps (310x)

As the Navy's principal seagoing Staff corps, the goal of the Supply Corps is to provide logistics support in all of the Navy's operational environments. Supply Corps officers are educated and trained to combine operational and business management expertise which enables them to acquire and support the Navy's current and future inventory of weapons systems. Supply Corps officers perform three basic functions: supply management, business/administrative management, and direct personnel support. To carry out these basic functions, Supply Corps officers develop expertise in a functional specialty such as; financial management, subsistence technology, operations analysis, computer systems management, and more.

16

The data set used in this study indicates 4.1 percent of the female LTs and 3.7 percent of the female LCDRs are in the Supply Corps.

2. **Civil Engineer Corps (510x)**

The mission of the Civil Engineer Corps (CEC) is to provide facilities engineering expertise and support to Naval Warfare. The effective operations of the Navy's shore facilities requires management as modern as the state of the art permits. Technical competence is the strength of the Civil Engineer Corps. The best description of a CEC officer is that of an engineer/manager. There are four basic types of duty available: public works, contract administration, construction battalion operations (Seabees) and staff. CEC officers are often assigned to large Naval or joint service staffs with a myriad of responsibilities ranging from long-range planning and approval of facility requirements to high level management of other civil engineer functional areas. The data set indicates that 1.0 percent of the female LTs and only .5 percent of the LCDRs are in the CEC corps.

3. **Miscellaneous**

Also falling under the Staff heading are several miscellaneous categories that include Medical, Dental, Nurses, Judge Advocate Generals (Lawyers), and Chaplains. LTs made up 27.3 percent of these communities and LCDRs made up 43.3 percent of the communities. For a review of the communities

17

and percentages of females in the main communities used in this thesis, see Table 1.

III. DATA AND METHODOLOGY

A. DATA

The data set used for this study combines individual information from the Officer Promotion History File and the Officer Loss Files for all officers considered for promotion from FY81 through FY90. The Officer Promotion History file contains a variety of pre-commissioning information on each officer, such as demographic, schooling, and prior service information. This study is confined to the population Lieutenant(LT) and Lieutenant Commander(LCDR) female Naval officers in the General Unrestricted Line, Restricted Line, Staff, and Medical communities. The LT file containes 3,666 females and the LCDR file contains 1,971 females.

This thesis also uses data from the Navy Officer Loss File, which is extracted from the Officer Master Loss Record File (maintained at the Defense Manpower Data Center, Monterey). This file is derived for the purpose of determining the reason for separation for those officers who separated at any time prior to a promotion board decision.

The loss file currently contains information on officers who are commissioned between January 1976 and 31 December 1982 and officers who left the service at any time following commissioning through 31 December 1990. As such, the loss file

19

will only cover officers at or below a LCDR selection board during the 1981 through 1990 time period.

B. VARIABLES

The Officer Master/Loss file contains more information than is needed for this thesis, so only certain variables are retained. Table 2 shows a list of variables taken from the officer master file for LT and LCDR. The LT and LCDR files are merged together by Social Security Number (SSN) to obtain a file of people who were LTs and who were promoted to LCDR. The SSNs were scrambled to maintain confidentiality. The merged file contains 1,383 observations. The frequency tables (Table 3) show how the officers are distributed by the variables being used in the models after taking into consideration missing or unknown information. The frequency tables show that almost half 47 percent of the data set GPAs fall in the 2.2-2.59 range, 75 percent are General Unrestricted Line officers; 84 percent are commissioned through the OCS and contract ROTC program; 48 percent majored in the biological and social science and almost one-half (44 percent) comes from competitive and less competitive schools.

Table 4 shows the separation codes contained in the officer loss files. This merged file contains 1,277 observations and is designated as LEAVERS. The Loss file is also used to denote a group of stayers designated as STAYERS. These are individuals who remain to LCDR (85 percent), but

20

also includes a small minority (14 percent) of those who separate involuntarily, but who might have stayed had they been given the opportunity. In addition, they are kept because they are of particular interest to the promotion models, in that they represent "poor" performance and are similiar to those officers later passed over. The LEAVERS and STAYERS frequency breakdown can be seen in Table 5 and Table 6. People who retired, were medically discharged, or disabled are excluded from the file.

TABLE 2. VARIABLES TAKEN FROM THE OFFICER MASTER FILE

SOURCE=Accession Source--USNA, ROTC-S, NESEP OCS, OCS/ROTC-C

PERF=Selection Board Performance

AGE=Age at commissioning date

RACE=White=C, Black=N, Other=X

DEPS=Marital status

UGSCH=Undergraduate college name

UGSEL=Undergraduate school selectivity index

UGMAJ=Undergraduate major

GPA=Grade point average

MQC=Math qualification code

TQC=Technical qualification code

PDES=Prior community designator

COMUN=Current community group

MASTR=Masters degree

TABLE 3. FREQUENCY TABLES OF VARIABLES CREATED FROM MERGED FILE LCDRLT

ACCESSION SOURCE

SOURCE	FREQ	PERCENT	CUM FREQ	CUM %
USNA	46	5.4	46	5.4
ROTC-R	73	8.6	119	14.0
NESEP	11	1.3	130	15.3
OCS/ ROTC-C	716	84.2	846	99.5
DA/ENL	4	0.5	850	100.0

ETHNIC CODE

RACE	FREQ	PERCENT	CUM FREQ	CUM %
CAUCASIAN	777	91.4	777	91.4
BLACK	59	6.9	836	98.4
OTHER	14	1.6	850	100.0

UNDERGRADUATE SCHOOL SELECTIVITY INDEX

UGSEL	FREQ	PERCENT	CUM FREQ	CUM %
HIGHLY COMP	70	8.2	70	8.2
VERYCOMP	63	7.4	133	15.6
MOST COMP	284	33.4	417	49.1
COMP	274	32.2	691	81.3
LESS COMP	102	12.0	793	93.3
NONCOMP	52	6.1	845	99.4
OTHER	5	0.6	850	100.0

UNDERGRADUATE MAJOR CODE

UGMAJ	FREQ	PERCENT	CUM FREQ	CUM %
ENG	23	2.7	23	2.7
MATH/CS	66	7.8	89	10.5
NAT/BIO SCI	188	22.1	277	32.6
SOC SCI	221	26.0	498	58.6
ARTS/COMM	144	16.9	642	75.5
MGT/ECON	106	12.5	748	88.0
ED/LIB SCI	102	12.0	850	100.0

UNDERGRADUATE GRADE POINT AVERAGE

GPA	FREQ	PERCENT	CUM FREQ	CUM %
0-1.89	19	2.2	19	2.2
1.9-2.19	141	16.6	160	18.8
2.2-2.59	402	47.3	562	66.1
2.6-3.19	195	22.9	757	89.1
3.2-3.59	93	10.9	850	100.0
3.6-4.0	0	0	850	100.0

MASTERS DEGREE

MASTR	FREQ	PERCENT	CUM FREQ	CUM %
NO	808	95.1	808	95.1
YES	42	4.9	850	100.0

MARITAL STATUS

STATUS	FREQ	PERCENT	CUM FREQ	CUM %
SINGLE	569	66.9	569	66.9
MARRIED	281	33.1	800	100.0

CURRENT COMMUNITY GROUP

COMMUNITY	FREQ	PERCENT	CUM FREQ	CUM %
GURL	634	74.6	634	74.6
URL/AVIAT	97	11.4	731	86.0
RL/STAFF	65	7.6	796	93.6
MEDICAL	54	6.4	850	100.0

24

TABLE 4.--SEPARATION CODES AND REASONS

CODES	REASONS	CODES	REASONS
BFV/HFV	nonphysical disability	BHF	failure to complete instr
JFL	disability severance pay		
JFM	prior service disability	BNC/BNG	unacceptable conduct
LBB	max age	DKK/GKK	misconduct/ drug abuse
RBD	20 or more yrs active service	DNB	malfeasance
SFK	temporary disability	GHK/JHK	substandard performance
MND/FND	misc individual	GKQ	commission of serious offense
MDB	hardship	JBC	complete max pd of service
FDF/MDF	pregnancy/ childbirth	JGB/LGB	nonselect perm promotion
SFJ	permanent disability	LDM	early release
FBK/MBK	complete required ser	LGJ	req for ext of service denied
FGY	transfer to another branch	MBM	insufficient retainability

25

TABLE 5.---VOLUNTARY LEAVERS

REASON	NUMBER	PERCENTAGE
Completed required service	1209	94.6
Pregnancy Childbirth	51	4.0
Miscellaneous Individual	19	1.4

TABLE 6.---STAYERS AND INVOLUNTARY DISCHARGERS

REASON	NUMBER	PERCENTAGE
Considered for higher grade	1383	87.2
Nonselect for permanent promotion	121	7.7
Request for extension denied	49	3.0
Substandard performance	33	2.1

To set up the model, retention and promotion outcomes are examined. For retention and promotion, the LILSTAER AND LCDRLT files are merged to produce a file of STAYERS. The total number of observations in this group is 1,586.

1. Dependent Variables

The dependent variable PRMTION is constructed by identifying individuals according to their performance code. This data set contains individuals who are selected early,

in-zone, and who are passed over on the "first look". If they were early or in-zone selected, PRMTION is coded as 1 otherwise it is coded as 0.

The dependent variable RETENT is constructed using the data set LEAVERS AND STAYERS. If the person is identified as a STAYER, RETENT is coded 1; otherwise it is coded 0.

2. Explanatory Variables

The variables used in this analysis are drawn from the data files described previously. All of the independent variables are categorized to represent personal characteristics that may affect retention and promotion. The first variable is a combination of accession source and college selectivity. Accepting a scholarship to the Academy or a NROTC scholarship requires that an individual pursue a technical course load that includes calculus and physics, regardless of one's chosen major. The ability to complete these additional courses may indicate possible academic or motivational differences between scholarship and regular students. Barron's Profile of American Colleges ranks schools as to being "highly competitive," "very competitive," "most competitive," "competitive," "less competitive," or "noncompetitive". If an individual graduated from a school ranked in the top three categories, it is listed as MORE. A person graduating from a school listed in bottom three categores is listed as LESS. To denote the accession source

27

MORE and LECS is added to the source to give a rating for the school. For example, if a person graduated from LESSOCS, which is the base case for this thesis, it means that the individual graduated from a school that was ranked in the bottom three categories and is commissioned through the OCS program. The sources included in the study are USNA, OCS, and ROTC.

Another variable to be considered is a student's undergraduate major. When a student first enrolls in school, the major they select is often more a function of interest than potential. Some students change their major several times. Selection of a major can also be thought of as a type of human capital. Graduates of some majors, such as engineering, are in greater demand by the civilian industry than others and can command a higher salary if they decide to leave the Navy in order to get a greater return on their investment.

Undergraduate major, UGMAJ is divided into two dummy variables, technical and nontechnical. Individuals with technical majors are coded as 1 otherwise 0. The technical majors are engineering, math, computer science, and operation analysis. The base case is nontechnical.

A variable is constructed to represent designator differences. Officers from the General Unrestricted Line community are in one category and are used as the base case. All other categories are grouped together under the dummy variable ALL.

Another important factor to control for in estimating the probability of promotion is whether or not an individual has received any postgraduate education. This is significant for two reasons. First Cymrot has shown postgraduate education has a positive influence on promotion [Ref. 17]. Second, receiving postgraduate education is another means of building human capital. For the civilian world the additional education increases the chance of an individual commanding a higher salary and position; and for the military it makes an individual much more competitive for promotion. In this data set, Master's degree is denoted as MASTR, and individuals possessing a master's degree are coded as 1 and those without a degree are coded as 0.

The variable MAR was constructed to represent marital status of individuals. MAR0 represented single individuals. People who fall into this category are coded 1 and those who do not are coded 0. This is the base case.

Race is included in the study. Black is coded as 1 and all others is coded as 0.

GPA is the final variable included and is kept as a continuous variable. It represents six ranges of grades, going from 1 which includes 0-1.89 to 6 which includes 3.6-4.0.

C. METHODOLOGY

The purpose of this thesis is to examine the retention and promotion rates of Navy female officers, primarily to see if

there is any difference in the rates of retention and promotion for General Unrestricted Line officers (GURL) and a group entitled ALL which includes other designators in the Unrestricted Line, Restricted Line, Medical, and Staff communities. The methodology applied will test the null hypothesis that, holding other factors constant, there is no difference between the promotion rates across communities.

The methodology used in this study to model retention and promotion utilizes multivariate regression procedures. Because the dependent variable is dichotomous, (stay or leave), (be promoted or fail to be promoted), the most appropriate model form is a logit model. The logit regression model best suits a binary dependent variable due to the asymptotic characteristics of the logistic function. The logit model is based upon the cumulative logistic distribution which restricts the dependent variable to zero or one [Ref. 18]. The value of the dependent variable is interpreted as the probability of the individual being retained or promoted. The logit analysis is defined as:

$$\text{prob (ret/pro)} = \frac{1}{1 + \exp(-\text{beta } Xi)}$$

where p is the probability that an individual is retained or promoted, e is the base of the natural logarithm, betas are the values for the estimated parameters of the models, and Xi are the values for the explanatory variables [Ref. 18]. The

30

advantage of logit over the linear probability model is that it constrains the output of the model to be within the (0,1) range [Ref. 19].

IV. ANALYSIS

The key to understanding the influence of the variables discussed in chapter III is the interpretation of the estimated regression models. Because the GPA variable has so many missing observations in the Medical community, four regression models are constructed. Two of the models include GPA but delete observations from the Medical community, while two of the models keep observations from the Medical community but delete GPA.

A. ANALYSIS OF RETENTION

Table 7 shows the mean values of explanatory variables in the STAYERS AND LEAVERS file. As can be seen, the biggest difference exists between the means of the LESSOCS groups. The results of logit retention models are interpreted from the beta coefficients, p values and "delta" values calculated from the base case analysis in Tables 8 and 9. The "delta" is computed as the change in the probability of retention or promotion of a set of individual characteristics from the base case. The base case is defined as a single, white, General Unrestricted Line officer who graduates from a less competitive college with a non-technical degree and is commissioned through the OCS program. As shown in Table 8, for the model that includes the Medical community, the retention

32

probability of the "base case" is 64.38 percent, whereas a similiar individual who instead graduates from the Naval Academy is 20.15 percent less likely to remain in service up to the time of her LCDR selection board. Several logit models are estimated using different combinations of explanatory variables. The following variables are used in the retention models, shown in Table 8 and Table 9: USNA, MOREOCS, MOREROTC, LESSROTC, MAR1, BLACK, TECH, ALL, MASTR, AND GPA. The first model includes observations from the Medical community and excludes the GPA variable from the model.

TABLE 7. MEAN VALUES OF STAYERS/LEAVERS

VARIABLE	STAYERS	LEAVERS
USNA	6.3	9.3
MOREROTC	9.8	12.2
LESSROTC	9.3	12.1
MOREOCS	25.8	19.6
LESSOCS	31.9	21.4
GPA	3.2	3.3
TECH	10.2	12.2
NONTECH	88.3	86.2
MASTR	3.2	2.0

TABLE 8. RETENTION MODEL WITH MEDICAL COMMUNITY

VARIABLE	COEFFICIENT	P VALUE	DELTA
USNA	-.8238	.0000 *	-.2015
MOREOCS	.2182	.0517 *	.0483
MOREROTC	.9153	.0778 *	.1749
LESSROTC	-1.5586	.0027 *	-.3683
MAR1	.9549	.0001 *	.1807
BLACK	.3101	.1238	.0676
TECH	-.0174	.9174	-.0040
ALL	-.8986	.0000 *	-.2199
MASTR	.8558	.0037 *	.1658
BASE CASE PROB	.6438		

* DENOTES SIGNIFICANCE

TABLE 9. RETENTION MODEL WITHOUT MEDICAL COMMUNITY

VARIABLE	COEFFICIENT	P VALUE	DELTA
USNA	-1.2139	.0000 *	-.2881
MOREOCS	-.1124	.4060	-.0235
MOREROTC	.4371	.4416	.0804
LESSROTC	-1.2796	.0237 *	-.3041
MAR1	.8812	.0155 *	.1435
BLACK	.2373	.3604	.0459
TECH	-.2834	.1292	-.0611
ALL	-.3075	.0596	-.0666
MASTR	.7120	.0620 *	.1216
GPA	-.1389	.0283 *	-.0996
BASE CASE PROB	.7144		

* DENOTES SIGNIFICANCE AT 05% OR HIGHER LEVEL.

1. Accession Source.

In the first model all of the accession source variables are statistically significant. However, in the second model, MOREOCS and MOREROTC are insignificant. Both the first and second model suggest that individuals graduating from the Naval Academy and those graduating from less competive schools and receiving their commission through the ROTC program are less likely to remain in the Navy than individuals graduating from a less competitive school and attending OCS. The estimated delta change from the base case suggests the probability of USNA graduates remaining in the service decreases by 20 percent in the first model and 28 percent in the second model. Graduates of less competitive ROTC schools are 36 percent less likely to remain in the service in the first model and 30 percent less likely to remain in the second model.

Model one shows graduates of more competive OCS and ROTC schools are more likely to stay in the Navy than the base case graduates. This might suggest that the better schools yield officers that are more likely to stay in the Navy. This differs from model two in that MOREOCS graduates are less likely to stay in and MOREROTC graduates are more likely to stay in. However, since MOREOCS and MOREROTC are not statistically significant in the second model, the results have to be interpreted with caution.

36

2. Academics.

The TECH variable is insignificant in both models. The results suggest that people with technical (TECH) degrees are less likely to remain in the service. The return on investment for individuals with a technical degree appears to be greater in the civilian sector. The GPA variable in the second model is significant. This indicates grades are important and those individuals with higher grades are less likely to remain in the Navy. The MASTR variable is significant in both models. This suggests people with a Master's degree remain in the service longer. This could be attributed to the fact that most Navy funded education requires extended obligation beyond the initial tour, however.

3. Other.

The BLACK variable is insignificant, but the delta analysis suggests Blacks have a slightly higher probability of staying in the Navy than the base case.

The MAR1 variable is significant in both models. In model two, there is a 14 percent increase in the probability of married individuals remaining in the service over single individuals. It supports the notion that married individuals are more likely to remain in the service longer than single individuals, primarily because they usually have more dependents, more responsibility, and are usually the primary breadwinner looking for a secure position.

The ALL variable indicates individuals in communities other than GURL are less likely to stay in the Navy. Model one shows individuals in ALL communities have a 22 percent decrease in the probability of remaining in the Navy. In Model two without the Medical community, there is only a 6.7 percent decrease in the probability of their remaining in the Navy. It appears that a large number of medical personnel are leaving the Navy. It is very hard to retain medical personnel because the civilian sector is willing to pay top dollar for them.

B. ANALYSIS OF PROMOTION

Whereas both leavers and stayers are included in the retention models, only individuals who voluntarily stay in the service prior to being promotion eligible are included in the promotion analysis. The following variables are used in the models: USNA, MOREOCS, MOREROTC, LESSROTC, MAR1, BLACK, GPA, TECH, and ALL. Model three includes observations from the Medical community and deletes the GPA variable and model four deletes observations from the Medical community and includes the GPA variables.

Table 10 gives the means of the selects and non-selects variables. The biggest difference again shows up in the LESSOCS group. The results derived from the promotion model are interpreted from the beta coefficients, p values, and "delta" values and are shown in Tables 11 and 12.

TABLE 10. MEAN VALUES OF SELECTS/NONSELECTS

VARIABLE	SELECTS	NONSELECTS
USNA	4.3	2.6
MOREROTC	9.0	4.2
LESSROTC	8.2	3.6
MOREOCS	30.8	26.2
LESSOCS	38.8	45.8
GPA	3.3	3.1
TECH	8.4	7.9
NONTECH	90.2	91.1
MASTR	5.2	2.8
GURL	61.4	64.7
ALL	32.8	32.3

TABLE 11. PROMOTION MODEL WITH MEDICAL COMMUNITY

VARIABLE	COEFFICIENT	P VALUE	DELTA
USNA	.6741	.0444 *	.1463
MOREOCS	.3403	.0098 *	.0783
LESSROTC	.6623	.2962	.1441
MOREROTC	.4223	.4916	.0958
MAR1	-.3530	.1339	-.0869
BLACK	.4024	.0647 *	-.0992
TECH	-.2094	.3636	-.0511
ALL	.0841	.4982	.0200
BASE CASE PROB	.6005		

* DENOTES SIGNIFICANCE

TABLE 12. PROMOTION MODEL WITHOUT MEDICAL COMMUNITY

VARIABLE	COEFFICIENT	P VALUE	DELTA
USNA	.8698	.0243 *	.0874
MOREOCS	.2656	.0758 *	.0330
LESSROTC	.6229	.3594	.0683
MOREROTC	.2729	.6812	.0339
MAR1	-.1619	.5834	-.0233
BLACK	-.1177	.6398	-.0167
TECH	-.3148	.2150	-.0476
ALL	.4474	.0528 *	-.0522
GPA	.1355	.0000 *	.0983
BASE CASE PROB	.8372		

* DENOTES SIGNIFICANCE AT 95% OR HIGHER LEVEL

1. Accession Source.

Both models indicate graduates of the Naval Academy and graduates of more competitive schools who attend OCS are more likely to be promoted than individuals from less competitive schools who attend OCS. The base case "delta" values show the probability of promotion increases 14.6 percent in model three and 8.7 percent in model four for graduates of the Academy. MOREOCS graduates have an 8 percent increase in their probability of promotion in model 3 and only a 3.3 percent increase in model 4. When GPA is excluded from the model, the accession source impact is very large in the Medical community. When the Medical community is excluded there is a smaller impact on USNA and MOREOCS.

The ROTC variables are both statistically insignificant. However, the base case "delta" values suggests the probability of promotion of graduates of LESSROTC schools increases 7 percent while graduates of MOREROTC increase 3.4 percent over LESSOCS graduates.

2. Academics.

GPA in the fourth model is a continuous variable and is highly significant. It suggests that GPA has an important positive effect on being promoted. As an individual's grades increase by one grade point, the probability of their being promoted increases by 10 percent.

The TECH variable is insignificant in both models. This goes against the notion that officers possessing a technical degree are more likely to perform better in our technical Navy.

3. Other.

The BLACK variable in model three suggests Blacks have a lower chance of being promoted. The "delta" value show a 10 percent decrease in the probabiliy of Blacks being promoted over the base case. Although Black is not significant in the fourth model, the "delta" suggests a two percent decrease in the probability of promotion. The model suggests there is no difference between the promotion rates of Black and white female officers once other factors are controlled in the logit models.

The MAR1 variable is insignificant in both models. The coefficients and "delta" values indicate, however, married individuals are slightly less likely to be promoted than single individuals.

The ALL variable is significant in model four. It suggests being in a community other than GURL or Medical enhances an officer's chance of being promoted. The increase in probability is about five percent over the base case. In the model with the Medical community included, the variable is insignificant, but the "delta" value shows a slight two percent increase in the probability of promotion over the base case.

4.Summary.

Models Two and Four will be emphasized because omitting GPA may cause serious misspecification error in the models.

Accession Source

* USNA and LESSROTC graduates are less likely to remain in the Navy.

* USNA and MORMOCS graduates are more likely to be promoted.

* ROTC not significantly different from OCS in regards to promotion.

Academics

* Individuals with high GPAs are more likely to get at of the Navy and more likely to be promoted.

* No differences appear to exist in the effect of an individual's curriculum on retention and promotion.

* Individual's with master's degrees are more likely to remain in the Navy.

Other

* Marital status plays a significant part in retention but does not appear to affect promotion.

* Race does not significantly affect retention or promotion, given other pre-commissioning background characteristics.

* Individuals in communities other than Medical and General Unrestricted Line are less likely to stay in the Navy and are more likely to be promoted.

43

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

This study sought to examine the retention and promotion rates of female Naval officers across communities. Although analysis is done on four models, the conclusions will address models two and four. Analysis of the results show being in a community other than GURL does have a significant effect on promotion and does enhance one's chance of being promoted. The results also show that being in a community other than GURL has a significant effect on retention. This is inconsistent with the original hypothesis, that there is no difference in promotion rates across communities. The difference in the retention rates could be due to the fact that the civilian community is constantly looking for experienced personnel in select officer communities and is willing to pay for them. Experienced officers make exceptionally good candidat for civilian jobs with their managerial and technical backgrounds.

The empirical results also show that technical undergraduate training has no significant impact on retention or promotion of female officers. Grades as a measure of human capital stock have a negative effect on retention. However, for individuals with high GPAs who stay in the Navy there is a positive effect of grades on promotion. In the upcoming

force reduction, the Navy should be emphasizing quality and looking for more able undergraduates regardless of whether or not they have a technical major.

When looking at the accession source, it can be seen that graduates of ROTC programs are no more likely to stay in nor are they more likely to be promoted than graduates from less selective OCS schools. Since it costs less to commission officers from less selective OCS schools, it may be more cost-effective to access more individuals from these schools.

There is a tradeoff involved with graduates from the Naval Academy. In general, they are less likely to stay in the Navy. However of those who do remain, USNA graduates are more likely to be promoted. Again, if extreme downsizing is enacted, the emphasis should be on quality and more females could be recruited from the Naval Academy.

Females in the General Unrestricted Line community have a smaller probability of staying in the Navy and are less likely to promote in the General Unrestricted Line than the other communities. This could imply that females have a more difficult time in this community. If the Navy wants to retain these individuals they might look at offering a bonus to qualified individuals as an incentive to stay in.

There are no significant differences in the retention or promotion patterns of Black and white females. I appears that the equal opportunity in the Navy is comparable to the civilian sector.

Married individuals are more likely to stay in the Navy, but there is no difference in promotion rates between married and nonmarried. In order to retain the single individuals, the Navy may want to specify some special programs addressed to single individuals to encourage them to stay in the Navy. One such program could be making the Variable Housing Allowance and Bachelors Allowance for Quarters the same for both married and single individuals.

B. RECOMMENDATIONS

This thesis examines only the external factors affecting promotion and retention. Internal factors such as conflicts with family affairs, civilian job opportunities, job satisfaction, and management practices should also be looked at. People who are dissatisfied are more likely to leave a job. Management practices are important in influencing a service member's satisfaction. One of the practices looked at in regards to retention could be the detailing process. Is there a high attrition rate because of dissatisfaction with the detailing process? Another area to look at are the accession sources. The model indicates that there is a 30 percent decrease in the probability of graduates of less competitive ROTC schools remaining in the Navy. When it is time to review NROTC units to close because of budget problems, these units could be l... .

Hopefully, the results presented in this thesis will enable the Navy to see the best sources from which to access female officers, what academic background is required of quality female officers, and once we get her how to retain that high quality female. Not only is it cost-effective to retain and promote experienced members, but with the expected decrease in the Navy budget, the Navy cannot afford to lose the wrong people.

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